JuxtaPinch: An Application for Collocated Multi-Device Photo Sharing

Nielsen, Heidi Selmer; Olsen, Marius Pallisgaard; Skov, Mikael B.; Kjeldskov, Jesper

Published in:
MobileHCI '14 Proceedings of the 16th international conference on Human-computer interaction with mobile devices & services

DOI (link to publication from Publisher):
10.1145/2628363.2633569

Publication date:
2014

Document Version
Early version, also known as pre-print

JuxtaPinch: An Application for Collocated Multi-Device Photo Sharing

Heidi Selmer Nielsen
Socio-Interactive Design Center
Aalborg University
Selma Lagerlofs Vej 300, DK
DK-9220 Aalborg East
Hsn.mobil@gmail.com

Mikael B. Skov
Socio-Interactive Design Center
Aalborg University
Selma Lagerlofs Vej 300, DK
DK-9220 Aalborg East
dubois@cs.aau.dk

Marius Pallisgaard Olsen
Socio-Interactive Design Center
Aalborg University
Selma Lagerlofs Vej 300
DK-9220 Aalborg East
marius.pallisgaard@gmail.com

Jesper Kjeldskov
Socio-Interactive Design Center
Aalborg University
Selma Lagerlofs Vej 300, DK
DK-9220 Aalborg East
jesper@cs.aau.dk

MobileHCI '14, Sep 23-26 2014, Toronto, ON, Canada
ACM 978-1-4503-3004-6/14/09.
http://dx.doi.org/10.1145/2628363.2633569

Abstract
We have developed an application called JuxtaPinch that allows users to share photos on multiple devices, i.e. mobile phones and tablets, while being collocated. JuxtaPinch employs simple and intuitive interaction techniques, e.g. pinching to connect devices, and it enables flexible physical positioning of devices and supports partial photo viewing. JuxtaPinch further enables users to use their own devices and access photos stored on own devices. In the Interactivity session, audience members can explore and view photos with friends and colleagues using different devices and experience defamiliarization and playful interaction with the photos – aspects that we have uncovered during lab and field studies of JuxtaPinch.

Author Keywords
Collocated photo sharing; pinching; multi device

ACM Classification Keywords
H.5.2 Information interfaces and presentation (e.g., HCI): Miscellaneous

Introduction
Research within mobile HCI has recently begun to explore and study opportunities and challenges of user interaction across several mobile platforms. Often referred to as multi-device interaction or cross-device interaction, this enables new and interesting application

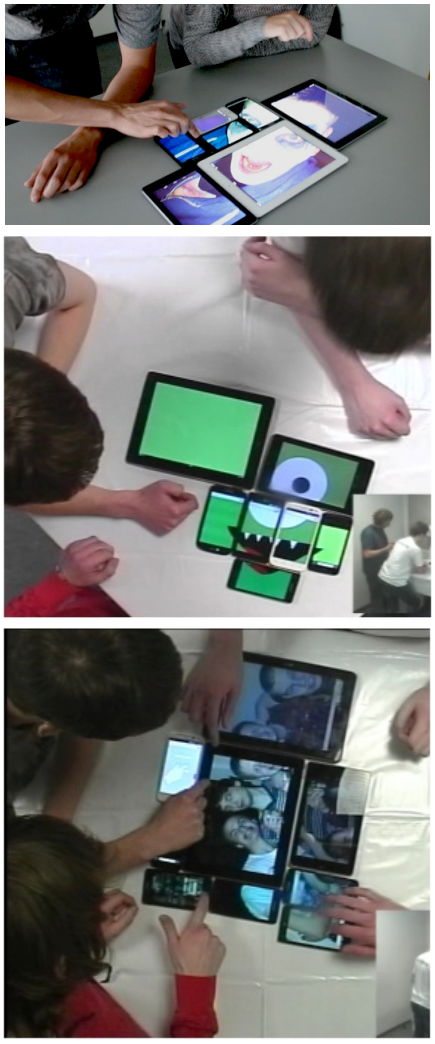

Figure 1: JuxtaPinch in use where several devices are being employed.

areas, e.g. taking and sharing photos. Collocated photo sharing plays an important role both socially and for the individual, developing people's self-image, as well as creating and strengthening relationships within social groups [7]. While online photo sharing Internet technologies, e.g. Instagram or Flickr, have gained huge success over the last years, these online photo sharing technologies lacks the richness of the social interaction that occurs when people share and view photos while being collocated. As a consequence, HCI is witnessing a growing interest in collocated sharing of photos through different kinds of mobile and pervasive technologies [2, 4], and more studies have investigated how to overcome and address some of the inherent problems when sharing photos with others on small screens on mobile devices [1, 6]. But we still lack technologies that can be used in real situations for collocated photo sharing on multiple devices.

In this paper, we present a multi-device platform application called JuxtaPinch that supports collocated photo sharing on multiple devices – both mobile phones and tablets (and different mobile operating systems). JuxtaPinch allows flexible positioning of devices next to each other and stitching their display areas together through a cross-device pinching gesture.

Motivation

With the rapidly increasing proliferation of smartphones and tablets in people's everyday lives, it is now not uncommon to have several devices at one's immediate disposal. Also, we bring and use these personal (and shared) technologies in many everyday life situations while being alone and together with other people. Research within HCI has started to explore a new class of "multi-device applications" that allow users to link individual mobile devices and use them as one joint interface. Examples of this include Pass-Them-Around by Lucero et al. [2], Junkyard Jumbotron by Borovoy & Knep [5], and Pinch by Ohta and Tanaka [4]. These all create and make use of larger screen real estate by physically placing a number of mobile devices next to each other and treating their combined display surface as joint. However, we address and provide solution for three opportunities within collocated photo sharing applications namely 1) flexible positioning of devices in relation to each other, as seen in [5], but combined with the simple interaction mechanisms for aligning and connecting devices without any external hardware [2, 4], 2) partial viewing of photos where parts of the photo can be left out and finally, 3) multi-device collocated photo sharing applications that works across different mobile operating systems.

JuxtaPinch

JuxtaPinch supports collocated photo sharing and exploration on multiple handheld and mobile devices. JuxtaPinch combines juxtapositioning, which is the act of positioning objects (i.e. devices) side-by-side, and pinching, which is the act of stitching devices together. We designed JuxtaPinch to support flexible positioning through pinching of juxtaposed devices and furthermore it supports partial viewing of photos by scaling the photo to fill all available screen real estate. The fundamental idea of JuxtaPinch is that photos from one device can be split across multiple devices (i.e. mobile phones and tablets), as illustrated in figure 1, by connecting them through the act of pinching.

Otha and Tanaka [4] argue that cross-device pinching resembles the action of stitching something together, and JuxtaPinch employs pinching as a simple technique

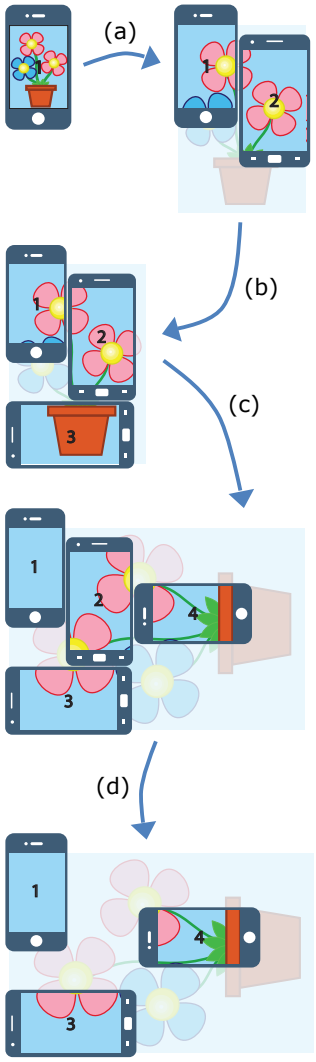

Figure 3: Scenario of use

for connecting devices. Basically, JuxtaPinch combines several screens (devices) to appear as one screen (as illustrated in the pictures in figure 1). This means that a photo shown on the system will extend over a multitude of devices. JuxtaPinch basically offers three different functionalities for exploring photos over several devices namely selecting a new photo, connecting devices, and disconnecting devices. JuxtaPinch allows the users to select photos among the photos stored in the library on the device. Users can access the gallery of their device and choose any photo from it. When a new photo has been chosen, all connected devices will disconnect such that the system provides a clean screen to build the new photo.

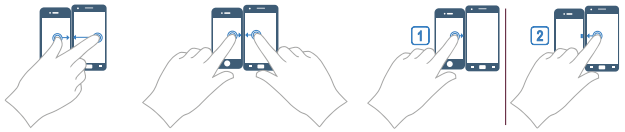

Figure 2: The implemented pinching techniques in JuxtaPinch: One-hand pinching, two-hand pinching, and two-step pinching.

We included three different but related pinching techniques to allow flexibility when connecting devices. Thus, JuxtaPinch integrates the following techniques: One-hand pinching, two-hand pinching, and two-step pinching. Inspired by Otha and Tanaka [4], we implemented one-hand pinching where users typically use their thumb and index finger on the two devices. The user then slides the fingers towards each other to connect the devices at the adjoining edges. Two-hand pinching inspired by Lucero et al [2] uses two hands. Here the users typically uses index fingers on both devices and slides them towards each other. Finally, we developed a two-step pinching technique during the testing phase of JuxtaPinch. Here the user slides his index finger to the edge of one device and then afterwards to the edge of the other device. We chose to allow all three pinching techniques because we were not interested in assessing or comparing these individual techniques, but instead interested in the use of multi-device applications enabled (for studies on pinching techniques please refer to [2, 4]).

JuxtaPinch allows users to remove and reposition devices when exploring photos. In order to reposition (or remove) a device, the user simply moves or lifts the device. Inspired by the repositioning in Otha and Tanaka [4], we utilize the accelerometer and gyroscope to detect movement as it is recognized as both tilting the device from side-to-side or top-to-bottom as well as acceleration on all axes.

In order to illustrate how JuxtaPinch can be used to explore photos while collocated, we include the following short use scenario (supported by the illustrations in figure 3). At the top left, we have a photo of a flower shown on one device. (a) Two devices are connected through pinching and the photo is shown across two devices (#1 and #2). (b) A third device is connected which now shows the lower part of the photo (the pot). (c) A fourth device is connected which makes the photo bigger (#4 is pinched together with #2) – this also rotates the photo 90 degrees. (d) Finally, device #2 is removed which creates a hole between the devices, as they are no longer positioned side-by-side. As it can be seen from the scenario, JuxtaPinch allows users to explore photos in many different ways including partial viewing where only selected parts of the photo is visible on the included devices.

Demonstration

We have presented JuxtaPinch that enables collocated photo sharing among people. JuxtaPinch allows users to share photos from one device across several devices including mobile phones and tablets.

In the demo and experience session at MobileHCI, audience members can explore and view photos with friends and colleagues using their own devices – setting up and connecting to JuxtaPinch will be simple through a website. Additionally, the researchers behind JuxtaPinch will provide additional devices – primarily tablets – to enable the audience to fully explore the application using many devices.

We have evaluated JuxtaPinch in a study with 22 participants and we found that the unification of multiple screens can change the perception of familiar photos – known as defamiliarization and the combination of several screens does not simply equal the same experience as a bigger screen. Finally, we found that partial viewing of photos encouraged playful sharing of photos where our participants would intentionally attempt to create funny situations in the photos. Our findings are further illustrated in [3].

Conclusion

We developed an application called JuxtaPinch that allows users to share photos on multiple devices, i.e. mobile phones and tablets, while being collocated. JuxtaPinch employs simple and intuitive interaction techniques, e.g. pinching to connect devices, and it enables flexible physical positioning of devices and supports partial photo viewing, and JuxtaPinch further enables users to use their own devices and access photos stored on own devices.

References

[1] Fails, J. A., Druin, A., and Guha, M. L. Content splitting & space sharing: collaboratively reading & sharing children's stories on mobile devices. In *Proceedings of the 13th International Conference on Human Computer Interaction with Mobile Devices and Services*, MobileHCI '11, ACM (New York, NY, USA, 2011), 361–370

[2] Lucero, A., Holopainen, J., and Jokela, T. Pass-them-around: collaborative use of mobile phones for photo sharing. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '11, ACM (New York, NY, USA, 2011), 1787–1796

[3] Nielsen, H. S., Olsen, M. P., Skov, M. B., and Kjeldskov, J. JuxtaPinch: Exploring Multi-Device Interaction in Collocated Photo Sharing. In *Proceedings of the 16th International Conference on Human Computer Interaction with Mobile Devices and Services*, MobileHCI '14, ACM (Toronto, Canada, 2014)

[4] Ohta, T., and Tanaka, J. Pinch: An interface that relates applications on multiple touch-screen by pinching gesture. In *Advances in Computer Entertainment*, A. Nijholt, T. Romo, and D. Reidsma, Eds., vol. 7624 of *Lecture Notes in Computer Science*. Springer Berlin Heidelberg, 2012, 320–335

[5] Rick, B., and Brian, K. Junkyard jumbotron. http://jumbotron.media.mit.edu**/**, June 2011

[6] Stelmaszewska, H., Fields, B., and Blandford, A. The roles of time, place, value and relationships in collocated photo sharing with camera phones. In *Proceedings of the 22nd British HCI Group Annual Conference on People and Computers: Culture, Creativity, Interaction - Volume 1*, BCS-HCI '08, British Computer Society (Swinton, UK, UK, 2008), 141–150.

[7] Van House, N. A. Collocated photo sharing, story-telling, and the performance of self. *International Journal of Human-Computer Studies, 67*, 12 (Dec. 2009), 1073–1086